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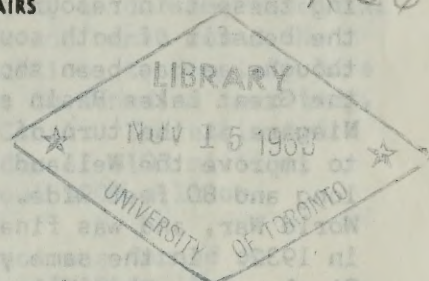
## REFERENCE PAPERS



CANADA

INFORMATION DIVISION  
DEPARTMENT OF EXTERNAL AFFAIRS  
OTTAWA - CANADA

CAI EAS  
-R26



No. 40

(Revised November 1963)

### THE ST. LAWRENCE SEAWAY AND POWER PROJECT

A 400-year-old dream was realized when, in April 1959, ships began using the St. Lawrence Seaway. The Seaway in the broadest sense is a deep waterway extending some 2300 miles from the Atlantic Ocean to the head of the Great Lakes at the heart of North America; strictly speaking, however, within the meaning of the legislation which permitted construction to get under way, the St. Lawrence Seaway extends from Montreal Harbour to Lake Erie and includes the Welland Canal.

In the early part of the sixteenth century, the French explorer, Jacques Cartier, was turned back by the rushing waters of the Lachine Rapids just west of what is now Montreal and was thereby forced to abandon his dream of finding the Northwest Passage and the route to the rich and glamorous East. At various times during the intervening 300-odd years, canals have been dug and locks built around the natural barriers to navigation in the St. Lawrence River and in the waters connecting the Great Lakes. This activity was spurred on by the desire to make use of the economical water route which the waters of the Great Lakes Basin offered for the transportation of goods in and out of this important area of the continent. The first such canals were built in 1783, but were only two feet deep. By 1850, 9-foot canals had been completed in Canada right through to the Upper Lakes. By 1900, 14 feet was the regulation depth in these canals, though certain of them -- Sault Ste. Marie, for example -- were deeper. In 1932, Canada completed the Welland Canal, 27 miles in length with a depth of 25 feet in some reaches. This canal and its eight locks overcome the differences in level of 326 feet between Lake Ontario and Lake Erie. Its construction may be considered as the first step, and a decisive one, in the construction of the present Seaway.

The needs of commerce pointed to the desirability of providing even greater depths in the St. Lawrence canals, locks and connecting channels and, by 1959, as a result of the joint efforts of the Canadian St. Lawrence Seaway Authority and the United States Saint Lawrence Seaway Development Corporation, 27-foot depths were available from Montreal to Lake Erie. The improvements to the Welland Canal between Lake Ontario and Lake Erie round the barrier of Niagara Falls have been the sole responsibility of the St. Lawrence Seaway Authority. Deepening the channels above Lake Erie to Seaway standards was done by others, and now 27-foot depths are available into the Upper Lakes.

While the Seaway development was in progress, the Hydro-Electric Power Commission of Ontario (HEPCO) and the Power Authority of the State of New York (PASNY) completed works in the International Rapids Section of the St. Lawrence to convert into electricity the energy that once expended itself by tumbling through the rapids west of Cornwall. The Barnhart Island-Cornwall generating plants produce 840,000 kw in each country.



## History of Negotiations

Negotiations between Canada and the United States aimed at developing these twin resources of the St. Lawrence River and the Great Lakes for the benefit of both countries began toward the end of the last century, though, as has been shown, piecemeal development of navigation by Canada in the Great Lakes Basin started centuries ago. Power was first developed at Niagara at the turn of the century. In 1912, the Canadian Government decided to improve the Welland Canal to provide 27-foot depths with locks 800 feet long and 80 feet wide. Work began in 1913, was suspended during the First World War, and was finally completed at a cost of approximately \$132 million in 1932. In the same year, Canada and the United States signed the St. Lawrence Deep Waterway Treaty, which was to provide for the joint development of the resources in the Great Lakes basin in the interests of both navigation and power. In 1934, this treaty was rejected by the United States Senate.

After further studies, and urged on by the power needs created by war production, Canada and the United States signed the Great Lakes - St. Lawrence Basin Agreement in 1941, with the same object in view. This agreement, which, like its predecessor, was submitted to the United States Senate for approval, remained unratified by 1949.

The 1941 agreement was intended, among other things, to permit the development, as a joint project, of the power resources available at Niagara Falls, where over the falls alone, 160 feet of drop is available for the production of power. Since there was little prospect by 1949 that the agreement would be approved, a separate treaty was signed and ratified in 1950 setting forth the principles under which the water in the Niagara River could be turned into power by Canada and the United States.

At about the same time, the Canadian Government let it be known that Canada was prepared to proceed with an "all-Canadian" seaway as far west as Lake Erie, once the means had been found to have the power works constructed concurrently in the International Rapids Section of the St. Lawrence River. By December 1951, the St. Lawrence Seaway Authority Act and the International Rapids Power Development Act had been approved by the Canadian Parliament, the first authorizing the construction of navigation works on the Canadian side of the river from Montreal to Lake Ontario as well as in the Welland Canal, the second authorizing the Hydro-Electric Power Commission of Ontario (HEPCO) to join a United States power-generating entity in constructing the necessary power works in the International Rapids Section of the St. Lawrence River.

In 1952, in order to get the power project under way, the Canadian and United States Governments submitted joint applications for the approval of the International Joint Commission to the proposed power development, on the understanding that the Canadian Government would undertake to construct more or less concurrently and to operate all the works necessary to insure uninterrupted 27-foot navigation between Montreal and Lake Erie. Approval of this proposal was given by the International Joint Commission in an Order of Approval dated October 29, 1952.

In 1953, the U.S. Federal Power Commission granted a 50-year license to the Power Authority of the State of New York (PASNY) for the development of the development of the United States half of this power project. Because the order granting this license to PASNY was contested in U.S. courts, it was not until June of 1954 that PASNY had clear authority to join HEPCO in making a start on these works.

In the meantime, however, the United States Congress had enacted the Wiley-Dondero Bill (P.S. 83-358), which authorized and directed the Saint Lawrence Seaway Development Corporation to construct, on United States territory, all the 27-foot navigation facilities required to get shipping round the navigational barriers in the International Rapids Section. The situation thereby created required close consultation between the Canadian and the United States Governments in order to avoid a duplication of locks and canals. A number of compromises and



accommodations were eventually worked out and embodied in a series of exchanges of notes, according to which the United States agreed to build a canal and two locks on United States territory to by-pass the Barnhart-Cornwall generating dam at the foot of the Long Sault Rapids and, in addition, to do some essential dredging elsewhere, while Canada agreed to build a lock and canal round the Iroquois Control Dam some 30 miles upstream and, in addition, to complete to a common standard all the necessary navigation facilities in Canadian territory, i.e. between Montreal and Cornwall and in the Welland Canal. The estimated cost to the United States of these works was of the order of \$100 million, while the estimated cost to Canada was to amount to about \$200 million.

The first sod on the St. Lawrence Power Project was turned on August 10, 1954. Work on the Seaway began in September of 1954. The Iroquois Lock was in regular use by May 1958 and the two United States locks also from July 4. First power came from the international powerhouses on the latter date. Through transit of the St. Lawrence Seaway began April 25, 1959, and the Seaway was opened officially by Queen Elizabeth II. and President Dwight D. Eisenhower of the United States on June 26, of that year.

#### Navigation Facilities

Some idea of the magnitude of the work undertaken can be obtained by taking an imaginary voyage on a ship west-bound from Montreal.

##### a) St. Lambert Lock:

Opposite the pool of Montreal Harbour can be seen the protecting dyke of the channel giving access to the Seaway, which begins just east of the Jacques Cartier Bridge, passes beneath the bridge and extends for three miles before reaching the first lock of the Seaway, the St. Lambert Lock, at the southern end of the Victoria Bridge. (At Victoria Bridge are lift spans and a system of rail and road traffic diversion.)

The St. Lambert Lock lifts the ship some 15 feet from the level of Montreal Harbour to the level of Laprairie Basin, through which the ship channel sweeps in a great arc  $8\frac{1}{2}$  miles long between its protecting embankments to the second lock.

##### b) Cote Ste. Catherine Lock:

The Cote Ste. Catherine Lock, like the other six new Seaway locks and the seven lift locks on the Welland Canal, has been built to the following standard dimensions: Length, 766 feet; length between stop signs in lock, 715 feet; width, 80 feet; depth over sills, 30 feet.

This lock, which requires 24 million gallons of water to fill, can be filled or emptied in less than ten minutes. It lifts ships from the level of Laprairie Basin through 30 feet to the level of Lake St. Louis. Its function is to by-pass the Lachine Rapids. Beyond it, the channel runs  $7\frac{1}{2}$  miles before reaching Lake St. Louis.

Over this channel at one point tower the piers that give Honoré Mercier highway bridge 120 feet of clearance for ships. Further upstream the Canadian Pacific Railway bridge has had two lift spans installed to allow for the passage of ships. These lift spans can be raised or lowered in a minute and a half.

##### c) Lake St. Louis and Beauharnois Locks

Entering Lake St. Louis, the ship proceeds some 12 miles by dredged channels before reaching the Lower Beauharnois Lock at the west end of the Lake.

The minimum width of St. Lawrence Seaway channels is 200 feet when provided with two embankments, 300 feet when there is only one embankment, and 450 feet in the open reaches. The depth in canals and channels is 27 feet.



The Lower Beauharnois Lock by-passing the Beauharnois Power House lifts the ship 41 feet so that it may pass through a short canal to the Upper Beauharnois Lock, where it is again lifted 41 feet to the level of Lake St. Francis; after some 13 miles in the Beauharnois Canal, the ship enters Lake St. Francis. It sails westward for some 30 miles by dredged channels to the head of the lake.

All locks and channels to this point have been built by Canada's St. Lawrence Seaway Authority.

d) United States Locks:

The ship canal leaves Lake St. Francis at the southwest corner and before long crosses the International Boundary just opposite St. Régis, Quebec. From here to the first lock on the United States side is only five miles. Entering the Bertrand H. Snell Lock, the ship is lifted 45 feet into the Wiley-Dondero Canal (10 miles long) and is then lifted another 38 feet by the Dwight D. Eisenhower Lock into Lake St. Lawrence, the power pool on which HEPCO and PASNY draw for the water used in the turbines at Barnhart Island-Cornwall Power House Dam, a mile to the north. The ship canal through Lake St. Lawrence passes where rapids once tossed the water into an angry foam.

e) Iroquois Lock:

At the western end of Lake St. Lawrence, the Seaway Authority of Canada has built a lock to allow ships to by-pass the Iroquois Control Dam. The lift here is only about one foot. Once in the waters of the St. Lawrence west of Iroquois, the ship channel meanders through the Thousand Islands past Prescott and Brockville, on to Kingston or Cape Vincent on Lake Ontario, thence by the open waters of the Lake to the great port of Toronto, to industrial Hamilton and to Port Weller.

f) Welland Canal:

From Port Weller on Lake Ontario to Port Colborne on Lake Erie is 27 miles. Through a series of eight locks (three of them twin locks in flight allowing passage of ships in both directions simultaneously), the ship is raised through 326 feet to the level of Lake Erie.

West on the Seaway route lie the Lake Erie ports, the chief ones being in the United States, such as Ashtabula, Cleveland and Toledo. Next, ships pass through the Detroit River, where Detroit and Windsor face each other across the International Boundary. Then, north through Lake St. Clair and the St. Clair River, the route serves Sarnia and the Lake Huron and Georgian Bay ports, important in Canada's wheat trade.

Access to Lake Michigan from Lake Huron is by means of the Strait of Mackinac, but the through route takes shipping north and west through the St. Mary's River, with a lift of some 20 feet by means of one of the four United States locks or the Canadian one at Sault Ste. Marie, to Lake Superior. Beyond lies the long run across the open lake to the United States lakehead at Duluth-Superior or the Canadian lakehead of Port Arthur-Fort William, at the very heart of the North American Continent, a full 2,000 miles from the Atlantic Ocean.

Seaway Economy

By most recent figures, new work on the Seaway proper from Montreal to Lake Erie will have cost Canada about \$340 million; work in the international reaches of the river will have cost the United States some \$130 million. (The two power entities will have spent \$600 million in developing the power at Barnhart - \$300 million by HEPCO and \$300 million by PASNY. These sums, which have been raised by floating bonds and by other types of borrowing, will be financed out of revenues realized from the sale of power.)



To recover the costs of construction, operation and maintenance of the navigation works, tolls are charged according to a schedule, which is published. (The toll receipts from the operation of the Montreal-Lake Ontario portion of the Seaway are divided between Canada and the United States on the basis of the respective annual charges of the two national Seaway entities -- 71 per cent to The St. Lawrence Seaway Authority (Canada) and 29 per cent to the Saint Lawrence Seaway Development Corporation (U.S.). All tolls from transit of the Welland Canal accrue to The St. Lawrence Seaway Authority. Not later than July 1, 1964, the two entities must report to their respective governments as to the sufficiency of the authorized tolls to meet the statutory requirements.)

### Traffic

In the course of a navigation season extending between April 15 and November 30, the intensity of traffic grows as the upstream end of the waterway is approached. On the Montreal-Lake Ontario section of the Seaway, some 25,600,000 tons of cargo transited in 1962; on the Welland Canal section, over 35,000,000 tons of cargo moved. The locks at the Sault have handled over 80,000,000 tons a year during recent navigation seasons. This waterway is primarily a bulk-cargo route and on the St. Lawrence Seaway itself over 90 per cent of the traffic is of this nature. From Seven Islands and other St. Lawrence ports upstream move 5,000,000 to 6,000,000 tons of iron ore to Hamilton and Ashtabula. Approximately 9,000,000 tons of grain from the Western prairies and the American mid-Western states are carried from the head of the lakes and other lake ports to the Montreal, Three Rivers and Quebec elevators and to markets abroad.

Furthermore, although United States ships move much of the Great Lakes cargo that does not come through the Seaway proper, two ships of every three that sail the St. Lawrence Seaway are of Canadian registry.

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to recover the costs of construction, operation and maintenance of navigation works, tolls are charged according to a schedule, which is attached. (The toll schedule from the operation of the Montreal-Lake Ontario Canal is attached between Canada and the United States on the basis of the respective tonnage of the two national Seaway entities - 50 per cent to the St. Lawrence Seaway Authority (Canada) and 50 per cent to the St. Lawrence Seaway Development Corporation (U.S.). All tolls from the operation of the Montreal-Lake Ontario Canal are to be paid to the St. Lawrence Seaway Authority. Not later than July 1, 1984, the two entities must report to their respective governments as to the satisfaction of the authorized tolls to meet the statutory requirements.)

#### Traffic

In the course of a navigation season extending between April 15 and November 30, the intensity of traffic grows as the upstream end of the waterway is approached. On the Montreal-Lake Ontario section of the Seaway, some 25,000,000 tons of cargo transited in 1982; on the Welland Canal section, over 35,000,000 tons of cargo moved. The locks at the Gault have handled over 50,000,000 tons a year during recent navigation seasons. This waterway is primarily a bulk-cargo route and on the St. Lawrence Seaway itself over 90 per cent of the traffic is of this nature. From seven islands and other St. Lawrence route upstream move 5,000,000 to 6,000,000 tons of iron ore to Hamilton and Ashabua. Approximately 3,000,000 tons of grain from the Western Prairies and the American mid-western states are carried from the head of the lakes and other lake ports to the Montreal, White River and Quebec elevators and to markets abroad.

For example, although United States ships move much of the Great Lakes cargo that does not come through the Seaway proper, two ships of every five that call the St. Lawrence Seaway are of Canadian registry.

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